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| APPLICATION NO.                                                              | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 10/049,567                                                                   | 02/15/2002  | Yasushi Sugawara     | 43888-121           | 7450             |
| 20277                                                                        | 7590        | 03/26/2004           | EXAMINER            |                  |
| MCDERMOTT WILL & EMERY<br>600 13TH STREET, N.W.<br>WASHINGTON, DC 20005-3096 |             |                      | WILLS, MONIQUE M    |                  |
|                                                                              |             | ART UNIT             | PAPER NUMBER        | 1746             |

DATE MAILED: 03/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                                      |                                        |
|------------------------------|--------------------------------------|----------------------------------------|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/049,567 | <b>Applicant(s)</b><br>SUGAWARA ET AL. |
|                              | <b>Examiner</b><br>Wills M Monique   | <b>Art Unit</b><br>1746                |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 15 February 2002.
- 2a) This action is FINAL.                            2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 1 and 4-13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) Claim(s) \_\_\_\_\_ is/are allowed.
- 6) Claim(s) 1,4 and 6 is/are rejected.
- 7) Claim(s) 5 & 7-13 is/are objected to.
- 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on 15 February 2002 is/are: a) accepted or b) objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) All    b) Some \* c) None of:
    1. Certified copies of the priority documents have been received.
    2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
 Paper No(s)/Mail Date \_\_\_\_\_.

- 4) Interview Summary (PTO-413)  
 Paper No(s)/Mail Date \_\_\_\_\_.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: \_\_\_\_\_.

**DETAILED ACTION**

***Priority***

Japanese foreign priority document(s) 11/242133, filed August 27, 1999, 11/28553, filed October 5, 1999 and 11/299645 filed October 21, 1999 submitted under 35 U.S.C. 119(a)-(d), has/have been received and placed of record in the file.

Japanese foreign priority document(s) 11/316723, filed November 8, 1999 and submitted under 35 U.S.C. 119(a)-(d), has NOT been received.

***Information Disclosure Statement***

The information disclosure statement(s) filed February 15, 2002 has/have been received and complies with the provisions of 37 CFR 1.97, 1.98 and MPEP § 609 .

***Claim Objections***

Claims 5, & 7-13 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim. See MPEP § 608.01(n). Accordingly, the claims 5 & 7-13 not been further treated on the merits.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 4 & 6 is rejected under 35 U.S.C. 102(e) as being anticipated by

Muranaka et al. U.S. Patent 5,500,292.

With respect to claim 4, Muranaka teaches a polymer electrolyte fuel cell comprising a cathode (72,72) and anode (74) arranged across a hydrogen ion-conductive polymer electrolyte membrane (71). See Figure 1 and column 9, lines 10-20. A pair of conductive separator plates (124) are disposed outside the anode and cathode and have gas flow paths for supplying fuel and oxidant to the anode and cathode respectively (Figure 12). Each electrode comprises a particulate catalyst (61) covered with water repellent (63), a hydrogen ion-conductive polymer electrolyte (col. 5, lines 64-68 & col. 3, lines 64-68) and a conductive base material (75). See Example 1. The limitation in claim 4, with respect to the water repellency of the cathode being higher than the anode is considered an inherent property of the prior art, because Muranaka teaches a cathode comprising a multiple layer hydrophobic gradient (Fig.

5). The cathode layers have a concentration distribution of water repellency that changes step wise (col. 2, lines 30-50 & col. 6, lines 1-5). Due to this concentration gradient, the diffusion rate of water increases and it becomes possible to remove water at a high efficiency (col. 6, lines 25-30). Therefore, providing a cathode structure with water a repellency higher than the anode. The anode does not contain a hydrophobic gradient (col. 2, lines 25-50) and thus, has a lower water repellency than the cathode. The instant claims are anticipated by the prior art set forth.

The limitation in claim 6, with respect to the gas permeability of the conductive porous base material of the cathode being 1.2 to 2 times that of the anode, is considered to be an inherent property of the fuel cell structure as set forth in the prior art, because Muranaka employs a cathode comprising a multiple layer porosity gradient (col. 7, lines 25-30). The cathode layers have a porosity distribution that changes step wise (col. 7, lines 20-30). Due to this porosity gradient, the diffusion of gas in the electrode can be carried out at a high efficiency (col. 3, lines 55-60). Therefore, providing a cathode structure with a gas permeability higher than the anode. The anode does not contain a porosity gradient (col. 2, lines 25-50) and thus, has a lower gas permeability than the cathode.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Muranaka et al. U.S. Patent 5,500,292 in view of Fuglevand et al. U.S. Patent 6,218,035.

Muranaka teaches a polymer electrolyte fuel cell comprising a cathode (72,72) and anode (74) arranged across a hydrogen ion-conductive polymer electrolyte membrane (71). See Figure 1 and column 9, lines 10-20. A pair of conductive separator plates (124) are disposed outside the anode and cathode and have gas flow paths for supplying fuel and oxidant to the anode and cathode respectively (Figure 12). Each electrode comprises a particulate catalyst (61) covered with water repellent (63), a hydrogen ion-conductive polymer electrolyte (col. 5, lines 64-68 & col. 3, lines 64-68) and a conductive base material (75). See Example 1. The water repellency of the cathode varies in direction of thickness, and is higher on the side of the electrolyte (Fig. 5).

The reference is silent to the water repellency of the conductive porous base material varying in the direction of thickness higher on the side of the separator plate than on the side of the polymer electrolyte membrane.

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Fuglevand teaches a cathode comprising a porous bas material having multiple layers of varying hydrophobicity. A porous carbon coating is applied in successive coats creating a hydrophobic gradient. The direction of the gradient may vary depending on the performance characteristics desired for the membrane electrode diffusion assembly. See column 10, lines 62-68 and column 11, lines 1-15.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the instant invention was made, because even though Muranaka does not teaches a hydrophobic gradient, wherein the water repellency is higher adjacent the separator plate, Fuglevand teaches that the direction of hydrophobicity may be reversed depending on the performance characteristics desired for the membrane electrode diffusion assembly. The skilled artisan may be motivated to change the orientation of the hydrophobic gradient to control the direction of moisture in the fuel cell.

### **Conclusions**

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Monique Wills whose telephone number is (571) 272-1309. The Examiner can normally be reached on Monday-Friday from 8:30am to 5:00 pm.

If attempts to reach Examiner by telephone are unsuccessful, the Examiner's supervisor, Randy Gulakowski, may be reached at 571-272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mw

03/19/04

*Bruce Bell*  
BRUCE F. BELL  
PRIMARY EXAMINER  
GROUP 1746

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